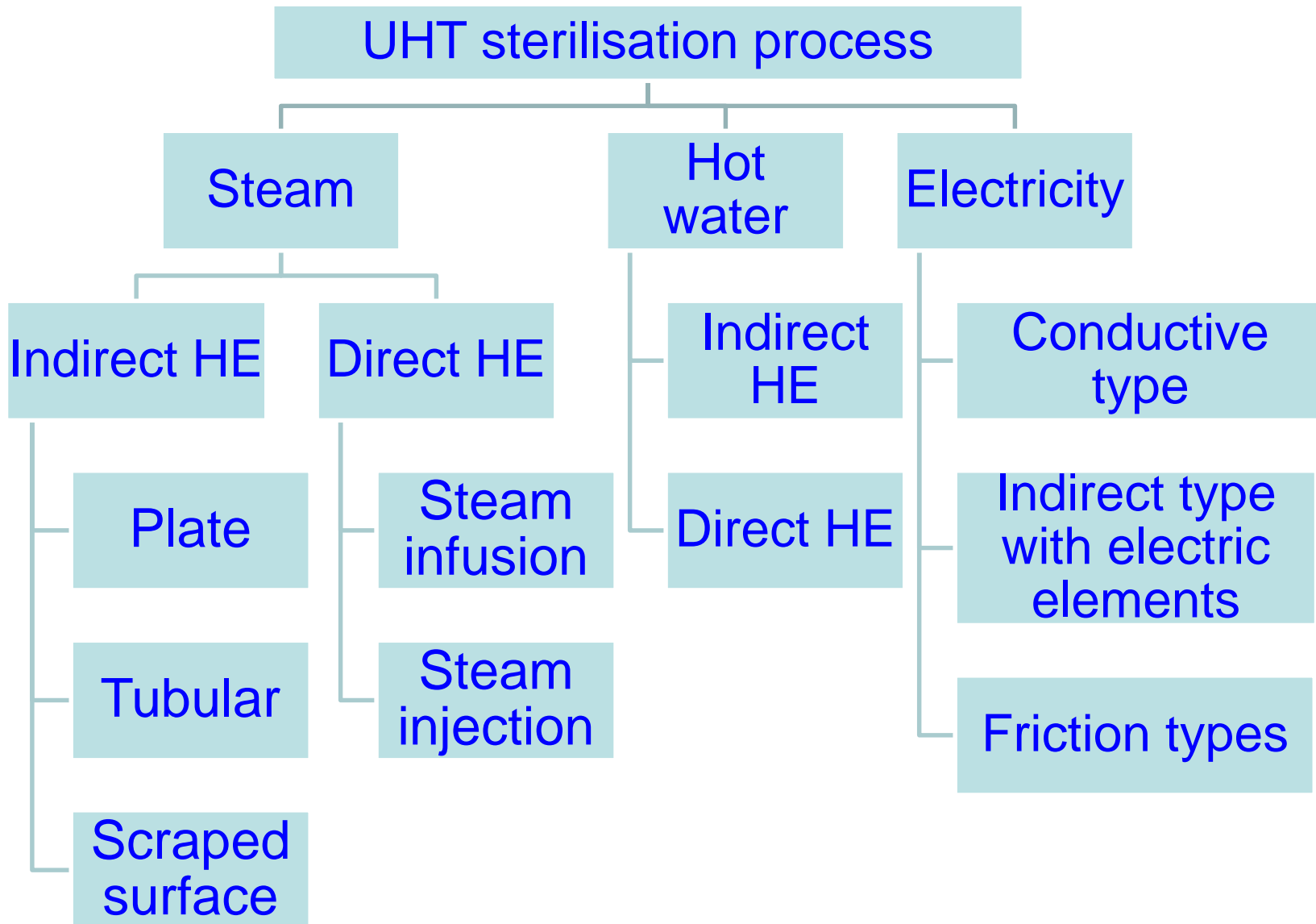


UHT processing

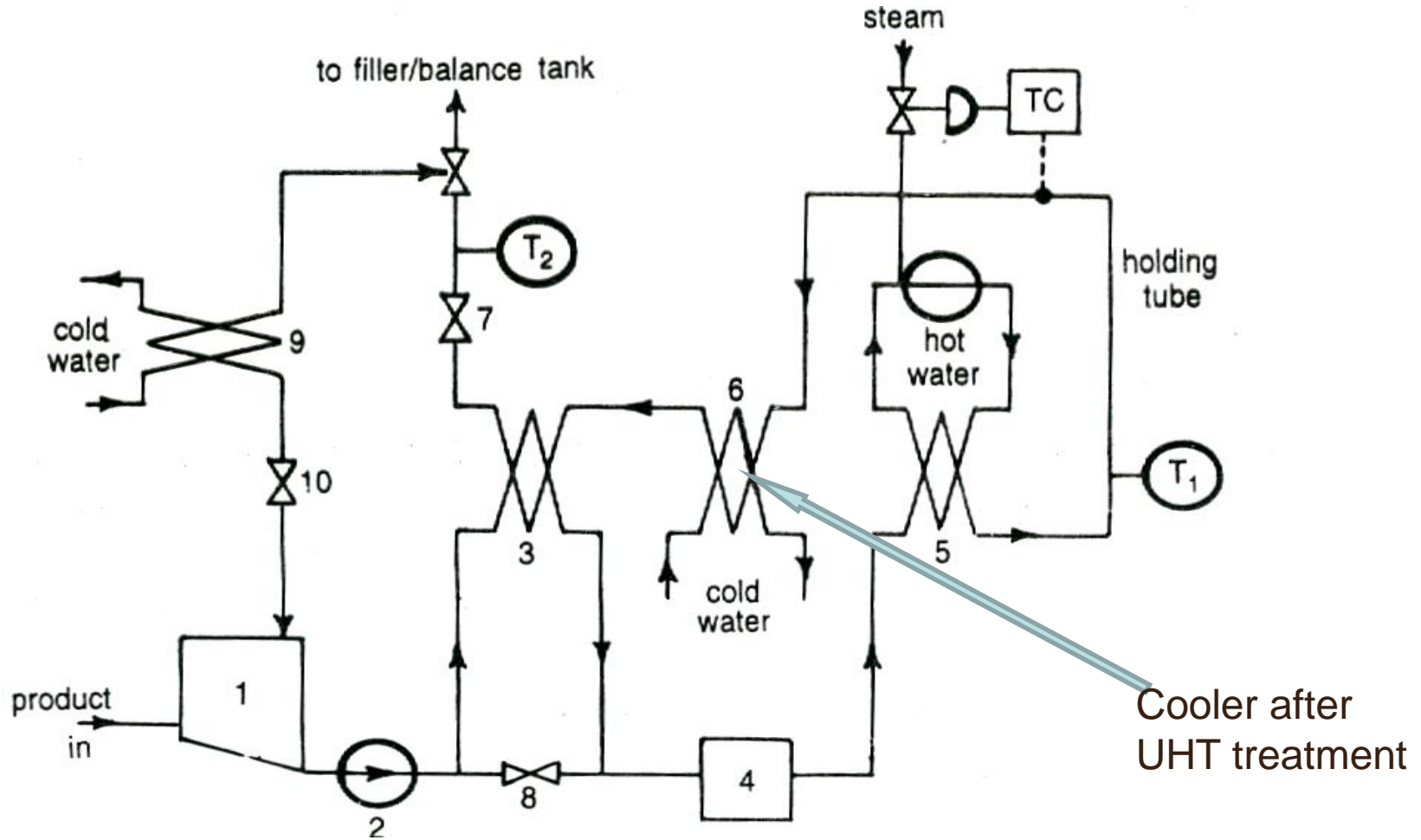
UHT processing

- **Temperature 135-150°C for few seconds.**
- **So the product is treated in a continuous HE.**
- **Causes much less chemical change than the conventional sterilisation process.**

Classification of UHT sterilisation process



UHT Sterilisation

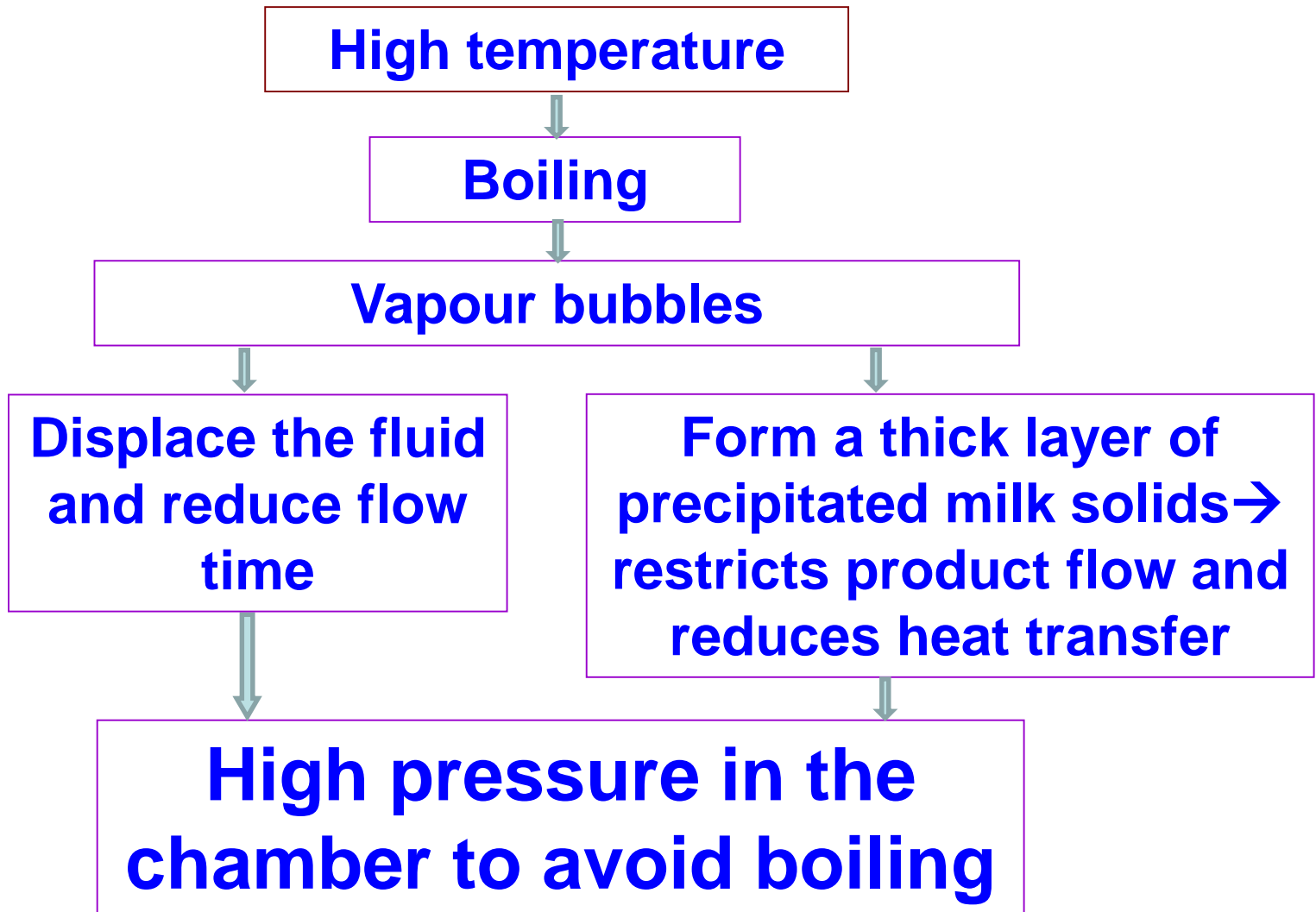


Indirect heating type

- (1) level-controlled balance tank (2) centrifugal pump (3) plate heat exchanger (4) homogenizer (5) heat exchanger (6) cooling section (7) restriction (8) by-pass valve (9) cooler (10) back-pressure valve

Taken from: Ahmed, T (2006)

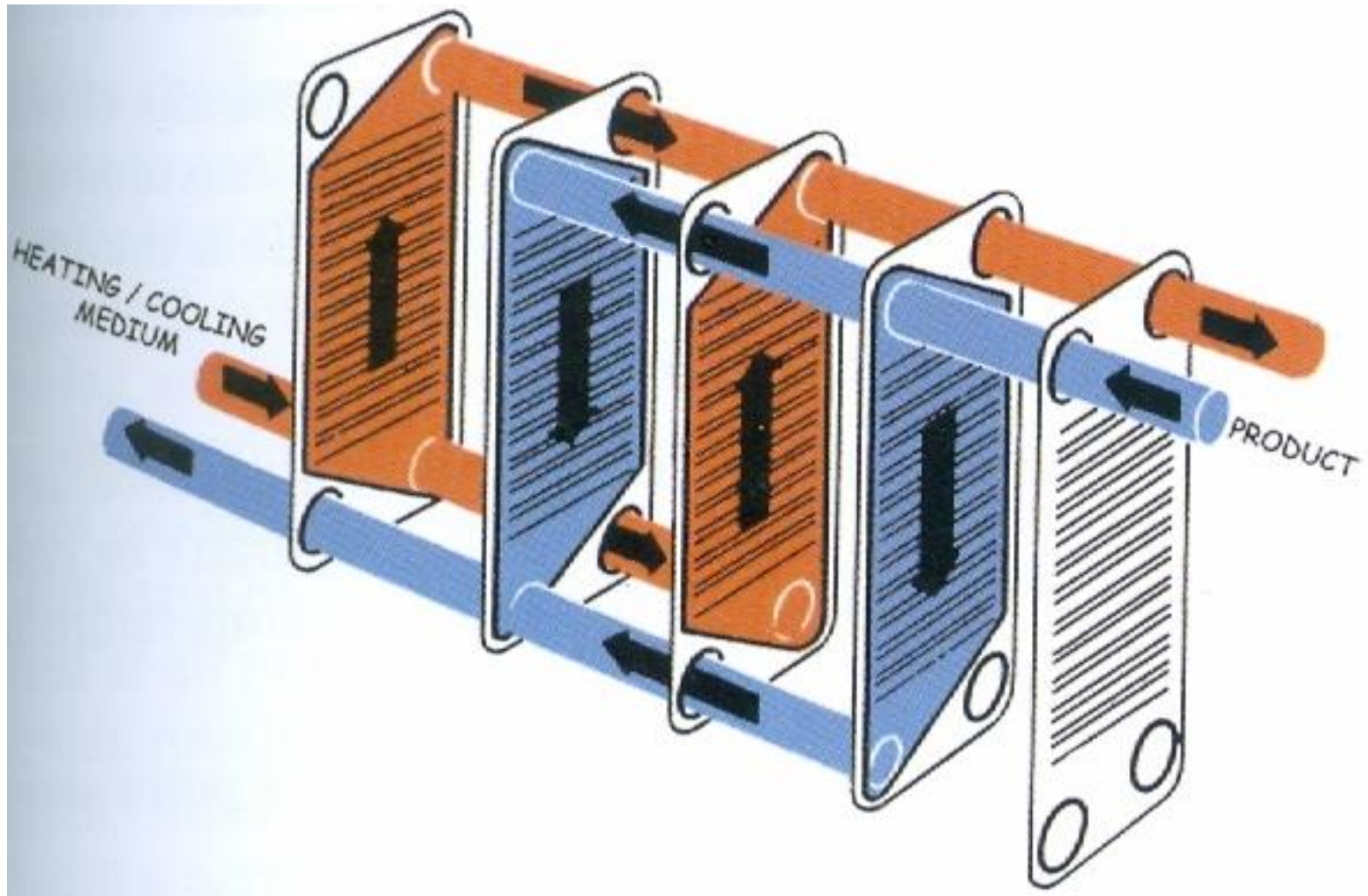
UHT Sterilisation



UHT Sterilisation

- At a temperature of 135°C and 150°C, a back pressure of about 2 bar and 3.75 bar is needed respectively.
- To prevent the separation of air at high temperature and formation of bubbles by the dissolved air, a back pressure over and above this → Internal pressures of about 4 bar where the temperature may be above 140°C.

UHT Sterilisation in Plate HE



UHT Sterilisation in Plate HE

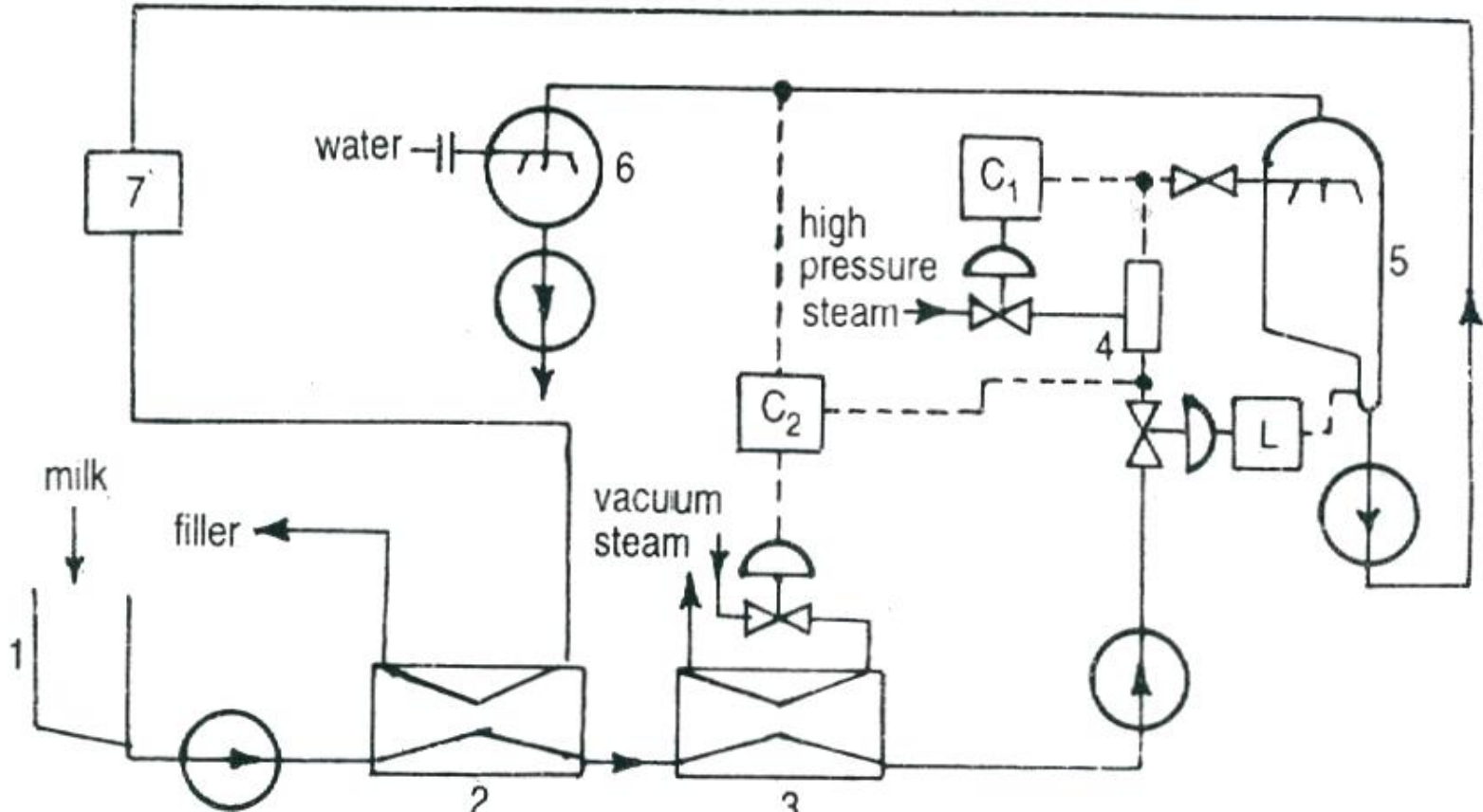
Plate heat exchanger must be able to withstand the high pressure.

To withstand these severe conditions of temperature and pressure, the **gasket materials** used with plates must be more sophisticated and expensive.

Medium nitrile rubber is suitable for temperatures up to about 138°C.

For higher temperatures (i.e. up to 155-160°C) **resin-cured butyl rubber** is suitable.

UHT Sterilisation

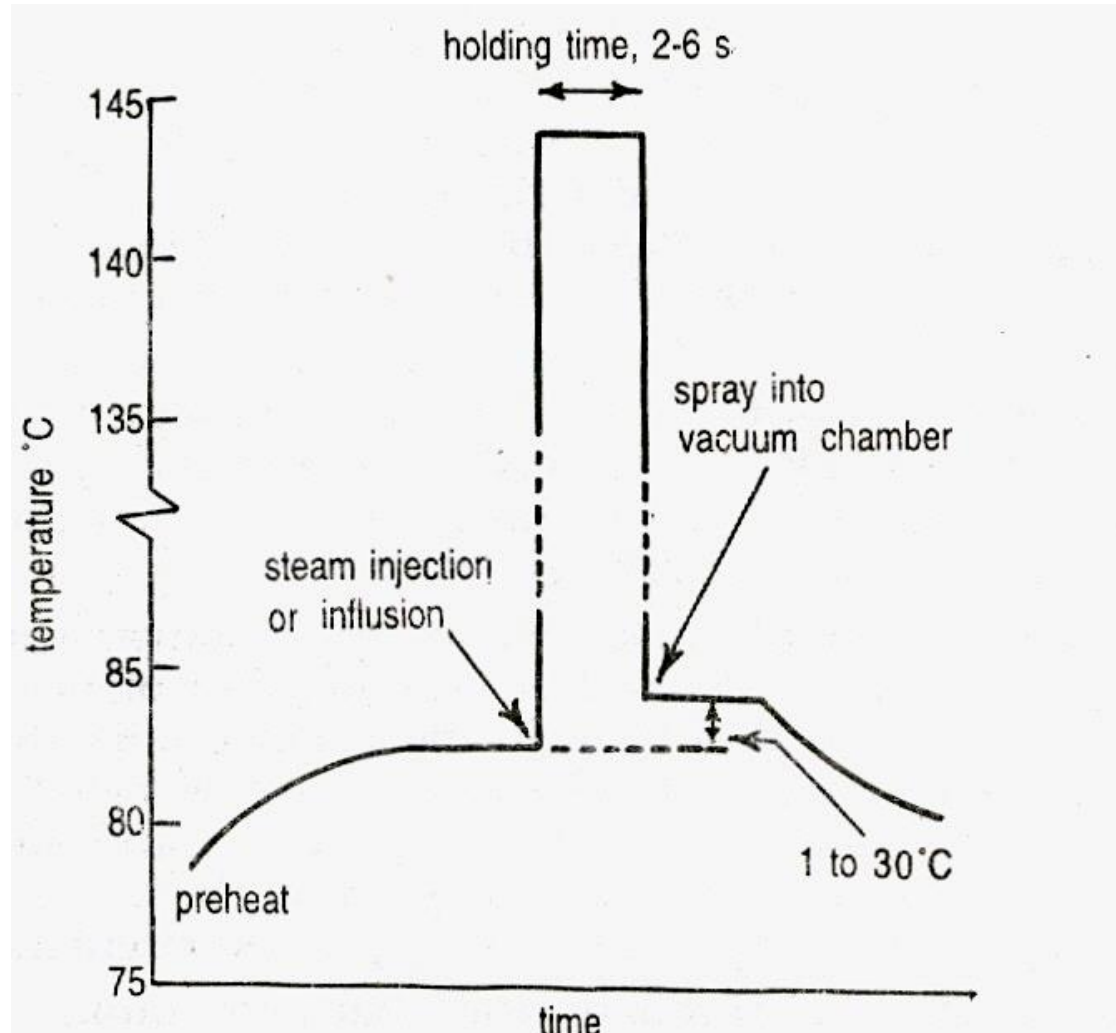


Direct heating injection system type

- (1) level-controlled balance tank (2) pre-heater (regenerator) (3) heat exchanger
(4) steam injector (5) expansion cooling vessel (6) water jet/ surface condenser
(7) homogeniser (L) controller (C) temperature controller

(Fig. 9.6, Page 232, Tufail Ahmed)

UHT Sterilisation



Direct heating injection system type

(Fig. 9.5, Page 230, Tufail Ahmed)

UHT Sterilisation

Ways to reduce fouling

- A high surface finish of the heat exchangers, as rough surface provides more surface to which material can absorb.
- The higher the liquid flow velocity. the less is the amount of fouling.
- A lower temperature differential between the heating medium and the product leads to less fouling(a lower differential lowers the temperature at the heating surface-product interface).
- **Preheating:** The amount of deposit is less if the product is first heated to 75°C or above and held at that temp. for 10 min or more. (reduced deposit due to denaturation of serum proteins and insolubilization of the milk salts by preholding at temperatures between 85°C and 110°C.)

UHT Sterilisation

Ways to reduce fouling

Back-pressure : To minimize fouling. it is necessary to maintain a sufficient back-pressure on the product not only to prevent boiling at the highest temperature within the heat exchangers but also to prevent the separation of dissolved gases which are normally present in the product.

A back pressure of at least 1 bar above that corresponding to the highest temperature in the heat exchanger is required.

The use of a high back pressure to reduce fouling is now standard practice in the UHT heat exchangers.

UHT Sterilisation

Ways to reduce fouling

The use of pressurized hot water tends to induce less fouling than steam heating and high product velocities also help to reduce deposits.

This latter approach is limited to holding time and pressure drop considerations.

Thank You